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WITH FACILITY OPERATIONS

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A DOE MULTI-SITE APPROACH TO SAFEGUARDS INTEGRATION WITH FACILITY OPERATIONS

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ABSTRACT

The Accountability Technology Exchange (ATEX) Working Group was established in October 1986 by the U. S. Department of Energy (DOE) to help identify nuclear materials accountability measurement needs within the DOE plutonium community and recommend potential improvements. ATEX Working Group membership represents nuclear materials production, safeguards, nondestructive assay (NDA), and analytical chemistry at a multitude of DOE plutonium sites. Currently, the ATEX Working Group has identified twenty NDA accountability measurement needs that fall into five major classes: NDA standards representing various nuclear materials and matrix compositions; NDA for impure nuclear materials compounds, residues, and wastes; NDA for product-grade nuclear materials; NDA for nuclear materials process holdup and in-process inventory; and NDA for nuclear materials item control and verification. Specific needs within these classes have been evaluated and ranked for individual sites and for the total DOE plutonium community.

INTRODUCTION

The Accountability Technology Exchange (ATEX) Working Group was established in October 1986 by the U. S. Department of Energy (DOE) Materials Management Executive Committee. It was chartered to help identify nuclear materials accountability measurement needs within the DOE plutonium community and recommend potential improvements.

ATEX Working Group membership includes experts in nuclear materials production, safeguards, nondestructive assay (NDA), and analytical chemistry. These experts represent Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), Rocky Flats Plant (RFP), Savannah River Laboratory/Plant (SRL/P), Westinghouse Hanford Company (WHC), Westinghouse Idaho Nuclear Company (WINCO), and DOE-Albuquerque. In short, the ATEX Working Group provides a multi-site, multidisciplinary forum for evaluating and recommending both existing and emerging nuclear materials accountability measurement technologies for implementation at DOE plutonium facilities.

Currently, the ATEX Working Group has identified twenty NDA accountability measurement needs within the DOE plutonium community. These have been segregated into five major classes: 1. NDA standards

representing various nuclear materials and matrix compositions; II. NDA needs for impure nuclear materials compounds, residues, and wastes; III. NDA needs for product-grade nuclear materials; IV. NDA needs for determining nuclear materials process holdup and in-process inventory; and V. NDA needs for nuclear materials item control and verification.

Needs identified within each of these classes have been described, evaluated, and ranked using eight "significance" criteria. These criteria, listed in order of descending significance, include: the impact of the need on criticality and radiation safety, on inventory difference, and on shipper-receiver difference, commonality of the need among sites, technical feasibility and cost effectiveness of a solution, additional process benefit of a solution, political sensitivity of the need, and present vs. future need for a solution.

CURRENT NDA NEEDS

A preliminary review of current nuclear materials accountability measurement problems and practices within the DOE plutonium community revealed twenty NDA needs. These needs were evaluated and ranked for the total DOE plutonium community (Table I). In addition, the current five greatest NDA accountability measurement needs at each of the five major sites in the DOE plutonium community were determined. To simplify comparison of site-specific and total DOE plutonium community ranking of NDA needs, site-specific needs are identified parenthetically in Table II by their numeric ranking (and thereby associated description) from Table I.

ONGOING ACTIVITIES

Ongoing ATEX Working Group activities include (1) identifying specific upgrades in NDA instrumentation to help assure compliance with DOE safeguards regulations and enhance process efficiency; (2) developing a methodology for integrating state-of-the-art nuclear materials accountability measurement technologies into existing and emerging process design and operation; and (3) enhancing communication of user accountability measurement needs to appropriate DOE funding agencies and safeguards research and development programs.

SUMMARY

The ATEX Working Group of the DOE Materials Management Executive Committee provides a multi-site, multidisciplinary forum for evaluating and recommending both existing and emerging nuclear materials accountability measurement technologies for implementation at DOE plutonium facilities. Currently, the ATEX Working Group has identified, evaluated, and ranked twenty NDA accountability measurement needs within the DOE plutonium community. Ongoing activities include recommending specific NDA instrumentation upgrades, developing a methodology for integrating state-of-the-art accountability measurement technologies into facility operations, and enhancing communication of user accountability measurement needs to promote their resolution.

TABLE I
CURRENT NDA NEEDS IN THE DOE PLUTONIUM COMMUNITY

| <u>Rank</u> | <u>NDA NEED</u> | <u>CLASS</u> |
|-------------|--|--------------|
| 1 | NDA standards representing various nuclear materials and matrix compositions | I |
| 2 | Impure and often heterogeneous Pu oxides and fluorides | II |
| 3 | Holdup and in-process inventory measurements for process equipment | IV |
| 4 | Heterogeneous Pu/U mixed oxides | II |
| 5 | Heterogeneous low-level and TRU solid wastes in volumes up through 55-gallon drums | II |
| 6 | Pu solution sampling techniques | III |
| 7 | Nuclear materials item control and verification | V |
| 8 | Pu bulk solution assay | III |
| 9 | Neptunium analysis | II |
| 10 | Impure and heterogeneous pyrochemical salt residues | II |
| 11 | Holdup and in-process inventory measurements for gloveboxes and canyon floors | IV |
| 12 | Real-time assay of Pu solution waste streams | II |
| 13 | Impure and heterogeneous scrub alloy and salt strip buttons | II |
| 14 | Holdup and in-process inventory measurements in high radiation environments | IV |
| 15 | Pu-238 solids isotopic assay | III |
| 16 | Holdup and in-process inventory measurements involving isotopic variations | IV |
| 17 | Impure and heterogeneous electrowinning heels | II |
| 18 | Heterogeneous low-level and TRU solid wastes in volumes greater than 55-gallon drums | II |
| 19 | Special isotope separation process residues and solid waste streams | II |
| 20 | Highly radioactive spent-fuel dissolver solutions | II |

TABLE II
CURRENT SITE-SPECIFIC NDA NEEDS

| <u>Rank</u> | <u>NDA Need</u> | | | | |
|-------------|----------------------|-------------|------------|--------------|------------|
| | <u>LANL</u> | <u>LLNL</u> | <u>RFP</u> | <u>SRL/P</u> | <u>WHC</u> |
| 1 | (1) | (1) | (1) | (1) | (1) |
| 2 | (10) | (4) | (10) | (2) | (2) |
| 3 | (2) | (16) | (2) | (4) | (3) |
| 4 | (3) | (19) | (4) | (3) | (11) |
| 5 | (4) | (3) | (3) | (13) | (9) |